

## STORMS AND WARNINGS—WEATHER AND CROP.

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## STORMS AND WEATHER WARNINGS.

EDWARD H. BOWIE, Supervising Forecaster.

## WASHINGTON FORECAST DISTRICT.

*Storm warnings on Lake Michigan.*—The season for the display of storm warnings closed on the Great Lakes in December, but because of there being more or less shipping on Lake Michigan advisory warnings of winds and weather dangerous to navigation are sent to open ports on that lake during the winter months. Such advices were issued on four occasions in January, namely, the 16th, 19th, 24th, and the 29th and 30th. That of the 16th for west and northwest gales, snow flurries, and colder weather was in connection with a well-defined disturbance that crossed the Great Lakes on this date. The highest velocity reported was 56 miles per hour at Grand Haven, Mich. On the morning of the 19th the warning was of southerly gales and rain, and these conditions occurred as forecast. On the morning of the 24th when a disturbance was central over Kansas and an area of high barometer of great magnitude had its crest north of Minnesota, increasing northeast and east winds probably reaching gale force, with snow, were forecast, while on the 29th and 30th advices of strong east and north winds and snow were issued in connection with a storm that was then moving eastward from Colorado.

*Storm warnings on the Atlantic coast.*—Advices of strong winds or gales were issued for sections of the Atlantic coast on the 9th, 10th, 13th, 14th, 16th, 17th, 20th, 26th, 27th, 30th, and 31st.

On the evening of the 9th, when a Gulf storm was central over Georgia and moving northeastward, northeast storm warnings were displayed on the coast from Cape Hatteras to Delaware Breakwater; and on the morning of the 10th the region of display of warnings was extended northward to Eastport, Me. Strong winds prevailed along the Middle Atlantic and southern New England coasts during the 10th and 11th.

The evening of the 13th southeast storm warnings were displayed at and between Charleston, S. C., and Boston, Mass., when an extensive area of low pressure was over the Mississippi Valley with steep barometric gradient to the eastward. On the 14th the display of warnings was extended northward to Eastport, Me., and the direction was changed to southwest at and between Boston, Mass., and Delaware Breakwater. Strong southerly winds and gales occurred during the 14th, the highest velocities being as follows: Wilmington, N. C., 30 south; Norfolk, Va., 44 south; Atlantic City, N. J., 32 south; New York, 68 southeast; Block Island, R. I., 48 south; Nantucket, Mass., 46 southeast; Boston, Mass., 32 south; and Portland, Me., 36 south.

A disturbance was central over the region of the Great Lakes the morning of the 16th and moving rapidly eastward. It was expected that it would increase in intensity, and therefore southwest storm warnings were displayed at 11 a. m. at all ports at and north of Cape Henry, Va. By the morning of the 17th this storm had moved to the Gulf of St. Lawrence, and westerly gales had occurred on the Middle Atlantic and New England coasts. The highest velocities reported were 84 at New York, 60 at Block Island, 44 at Nantucket, 38 at Boston, and 36 at Eastport.

The pressure was quite low the morning of the 20th over the Great Lakes, with the center of the low-pressure area north of Lake Huron.

At 10:30 a. m. southwest storm warnings were ordered displayed on the coast north of Sandy Hook. This disturbance moved rapidly eastward, and strong southwest winds and gales occurred on the New England coast during the afternoon and night of the 20th.

A storm of considerable intensity was, at the 8 p. m. observation of the 26th, over southeastern Georgia, and there were indications that it would move northeastward. Accordingly, northeast storm warnings were ordered displayed on the coast at and between Cape Henry and Wilmington, N. C. This storm moved as forecast, and strong winds and gales occurred over the area covered by warnings.

At 10 p. m. of the 30th northeast storm warnings were ordered for the coast at and north of Sandy Hook, N. J., and the morning of the 31st the display was extended south to Delaware Breakwater. Northeast gales set in during the early morning of the 31st on the New England coast, and there were strong northerly winds and snow on the New Jersey coast.

*Storm warnings on the east Gulf coast.*—No storm warnings were ordered, and there were no storm winds over the east Gulf during the month.

*Cold-wave and frost warnings.*—Frost warnings were issued on a number of days for the South Atlantic and east Gulf States. There were few cold waves during the month. Cold-wave warnings were issued on the 16th for the Northern States; on the 29th for Michigan and Indiana, and on the 31st for the Atlantic States north of Pennsylvania. No heavy snow warnings were issued during the month.

*Chicago forecast district.*—The month for the most part was unusually mild throughout the Chicago forecast district and only a few special warnings of any kind were necessary, the first being issued on the 15th and 16th, when a cold wave of moderate proportions overspread portions of North Dakota, Minnesota, Wisconsin, eastern Iowa, and the northern portions of Illinois and Missouri. No other cold-wave warnings were issued during the month, except for Williston, N. Dak., and Duluth, Minn., on the morning of January 29.

Advices to stock interests located on the eastern slope of the Rockies and the western portions of the Plains States were issued on January 10, 15, and 24, on the latter date heavy snow warnings also being issued for western Nebraska and northwestern Kansas.—*E. H. Haines.*

*New Orleans forecast district.*—Unseasonably mild weather prevailed and few warnings were needed.

No storm warnings were issued and no storms occurred except on the afternoon of the 14th, when northwest winds slightly exceeded the verifying velocity on the east coast of Texas. These winds occurred while a disturbance was moving east-southeast over the Great Lakes and an area of high pressure was stationary over Nevada and the Southwest, with isobars trending northwest-southeast over the Southern States. The barometric gradient was moderate.

A moderate cold wave occurred in Oklahoma on the 8th, for which warnings were issued the morning of the 7th.

Frost warnings for west Gulf coast sections were issued on the 1st, 8th, 9th, 14th, 15th, 25th, 26th, and 27th; and freezing nearly to the coast on the 26th. These warnings were nearly all verified.

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Fire-weather warnings for the national forest areas of Oklahoma and Arkansas were issued on the 19th and conditions occurred mostly as forecast.—*R. A. Dyke.*

*Denver forecast district.*—North Pacific LOWs predominated, as in the preceding month, and unusually warm and dry weather prevailed in the greater part of the district. The winter, so far, has been notable for the absence of severe storms and low temperature.

Live-stock warnings were issued for eastern Colorado on the morning of the 10th, a south Pacific LOW of moderate intensity being central in Arizona and an area of high pressure in the north Pacific States and northern Rocky Mountain region. Temperatures near zero were reported in parts of Wyoming. Temperatures near zero occurred in localities in eastern Colorado on the 12th, preceded by snowfall. The live-stock warnings were extended to eastern New Mexico on the morning of the 11th. Snow, with temperatures well below the freezing point, occurred in eastern New Mexico on the 12th and 13th.

Moderate to heavy snowfall occurred in eastern Colorado on the 24th, following the unusual movement of an area of low pressure from the Gulf of California. The center of the disturbance was over northeast Arizona at 6 a. m. on the 23d. It moved southeastward to Roswell, N. Mex., by 6 p. m. of that date. During the following night the center moved almost directly northward to eastern Colorado, after which it again moved southeastward, being over Alabama, at 6 a. m. on the 25th. The temperatures following the snowfall were low in extreme eastern Colorado but moderate elsewhere.—*Frederick W. Brist.*

*San Francisco forecast district.*—January was an unusually stormy month in this district. The whole north

Pacific Ocean was in a turmoil nearly all the while. The storms traveling inland passed farther south than customary, due largely to the fact that the pressure over northern Alaska was frequently above normal. On this account rain and heavy snow occurred in the Pacific States farther south than usual.

No less than 20 storm, four small-craft warnings, and one advisory warning were issued during the month. Practically all were verified in part, if not wholly. Casualties on sea and land were incommensurate with the violence of the storms; there being no bad disasters as yet reported at sea and no great interruption to traffic on land.

The worst storm was experienced along the north Pacific coast during the afternoon and evening of the 29th, when a maximum wind velocity of 110 miles from the southwest occurred at Tatoosh Island and an estimated velocity of 150 miles from the southeast at North Head was reported. The North Head station reported the anemometer there was destroyed by a falling wireless tower when it was recording 132 miles an hour, and that a conservative estimate of the maximum velocity for the storm was 150 miles. This is a record breaker, so far as that station is concerned.

The rains caused moderate freshets in the Sacramento River, but the stages reached by the water were not high enough to cause serious damage.

Frost warnings were issued on 18 days for parts of California. The heaviest frosts occurred on the mornings of the 9th, 10th, and 11th, and they did considerable damage to truck crops and citrus fruit. The citrus crop, however, as a whole was not seriously affected by the cold weather and at the close of the month it was in a promising condition.—*E. A. Beals.*

## RIVERS AND FLOODS.

### FLOODS DURING JANUARY, 1921.

By H. C. FRANKENFIELD, Meteorologist.

[Weather Bureau, Washington, Feb. 28, 1921.]

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*Atlantic drainage.*—There were no floods north of North Carolina except a purely local one in the James River at Columbia, Va., on January 15. The flood came from the Rivanna River, and the flood stage was barely reached. No damage was done.

Heavy rains reported on January 10 caused moderate floods in the lower Roanoke River with a crest of 34.6 feet, 4.6 feet above the flood stage, at Weldon, N. C., on January 12. There was also a moderate flood at the same time in the Pee Dee River at Cheraw, S. C., with a crest of 27.2 feet, 0.2 foot above the flood stage. More heavy rains reported on January 14 resulted in a second flood in both of the above-mentioned rivers and also in the Neuse and Cape Fear Rivers, but the stages were not excessive. A third rise was forecast for the Pee Dee River from the melting of the heavy snows that fell over headwaters from January 25 to January 27, inclusive, and a crest stage of 25.2 feet was reached at Cheraw on the morning of February 2.

All of these floods were properly forecast and little or no damage occurred. Live stock, to the value of \$5,000, was saved by the warnings for the Cape Fear River.

Moderate floods in the Broad and Wateree Rivers of South Carolina at about the same time were forecast as a whole, although with indifferent success for the Wateree River on account of lack of information as to the amount of water released at the Wateree Power Co. dam, about 9 miles above Camden. The same trouble apparently

operated to cause the failure on January 28 of the forecast of 27 feet at Camden by January 29. This forecast was based upon the melting of the heavy snow and ice that accumulated over headwaters from January 25 to 27, inclusive.

The Santee River remained above flood stage throughout the entire month with no material damage. This river has been in flood for so long a period and the swamps are so full of water that little if any grazing could be carried on.

*Gulf drainage.*—The Tombigbee River was above flood stage of 39 feet at Demopolis, Ala., for about six days, beginning with January 14 and a crest stage of 43.8 feet was reached at 3 p. m. January 16. Warnings had been issued on January 12. Damage amounted to about \$22,000, \$20,000 of which covered the sinking of a towboat. Value of property saved through warnings, about \$2,200.

High water prevailed in the Pearl River of Mississippi at the beginning and continued until well after the middle of the month.

A middle of the month flood in the upper Trinity River of Texas was well forecast. The flood was a moderate one and live stock was removed from the lowlands before its arrival.

Following heavy rains on January 12 and 13, floods were forecast for the Sulphur River of Texas, and stages from 2 to 3 feet above the flood stages were reached at the time specified in the warnings.